
Clinical cell therapy imaging using a perfluorocarbon tracer and fluorine-19 MRI.

Journal: Magn Reson Med

Publication Year: 2014

Authors: Eric T Ahrens, Brooke M Helfer, Charles F O'Hanlon, Claudiu Schirda

PubMed link: 25241945

Funding Grants: Molecular Imaging for Stem Cell Science and Clinical Application

Public Summary:

PURPOSE: Cellular therapeutics are emerging as a treatment option for a host of serious human diseases. To accelerate clinical translation, noninvasive imaging of cell grafts in clinical trials can potentially be used to assess the initial delivery and behavior of cells. **METHODS:** The use of a perfluorocarbon (PFC) tracer agent for clinical fluorine-19 ((19) F) MRI cell detection is described. This technology was used to detect immunotherapeutic dendritic cells (DCs) delivered to colorectal adenocarcinoma patients. Autologous DC vaccines were labeled with a PFC MRI agent ex vivo. Patients received DCs intradermally, and (19) F spin-density-weighted MRI at 3 Tesla (T) was used to observe cells. **RESULTS:** Spin-density-weighted (19) F images at the injection site displayed DCs as background-free "hot-spot" images. (19) F images were acquired in clinically relevant scan times (<10 min). Apparent DC numbers could be quantified in two patients from the (19) F hot-spots and were observed to decrease by approximately 50% at injection site by 24 h. From 3T phantom studies, the sensitivity limit for DC detection is estimated to be on the order of approximately 10(5) cells/voxel in this study. **CONCLUSION:** These results help to establish a clinically applicable means to track a broad range of cell types used in cell therapy.

Scientific Abstract:

PURPOSE: Cellular therapeutics are emerging as a treatment option for a host of serious human diseases. To accelerate clinical translation, noninvasive imaging of cell grafts in clinical trials can potentially be used to assess the initial delivery and behavior of cells. **METHODS:** The use of a perfluorocarbon (PFC) tracer agent for clinical fluorine-19 ((19) F) MRI cell detection is described. This technology was used to detect immunotherapeutic dendritic cells (DCs) delivered to colorectal adenocarcinoma patients. Autologous DC vaccines were labeled with a PFC MRI agent ex vivo. Patients received DCs intradermally, and (19) F spin-density-weighted MRI at 3 Tesla (T) was used to observe cells. **RESULTS:** Spin-density-weighted (19) F images at the injection site displayed DCs as background-free "hot-spot" images. (19) F images were acquired in clinically relevant scan times (<10 min). Apparent DC numbers could be quantified in two patients from the (19) F hot-spots and were observed to decrease by approximately 50% at injection site by 24 h. From 3T phantom studies, the sensitivity limit for DC detection is estimated to be on the order of approximately 10(5) cells/voxel in this study. **CONCLUSION:** These results help to establish a clinically applicable means to track a broad range of cell types used in cell therapy.

Source URL: <http://www.cirm.ca.gov/about-cirm/publications/clinical-cell-therapy-imaging-using-perfluorocarbon-tracer-and-fluorine-19>